

Table 2.7-1. Zortman Mine Reclamation Alternatives Comparison

Mine Feature <i>Interim Reclamation Action</i>	<i>Alternative Z1, Existing DEQ Reclamation Plans (FEIS Alt. 3 & 1998 ROD)</i>	<i>Alternative Z2, Optimized Water Treatment within Bond Amounts</i>	<i>Alternative Z3, Optimize Source Control within Bond Amounts</i>	<i>Alternative Z4, Added Backfilling with Barrier Reclamation Covers</i>	<i>Alternative Z5, Extensive Backfilling with Soil Reclamation Covers</i>	<i>Alternative Z6 Optimize Grading for Source Control (Preferred Alt.)</i>
General Reclamation Cover Description (see also Figure 2.4-1):						
Water Barrier Cover	Use on slopes flatter than 4H:1V over 24" neutral waste. Place a GCL, 36" NAG/ subsoil, 12" soil, and revegetate.	Used in backfilled pit area. 24" neutral waste, geosynthetic membrane liner, 36" NAG/ tailings, 12" soil, and revegetate.	Same as Alt. Z3.	Same as Z1 cover, but use geosynthetic membrane such as HDPE or PVC instead of GCL in cover construction.	Use on slopes flatter than 4H:1V. Place geosynthetic liner, 24"NAG, 10" Ruby tailings, 8" soil, and revegetate.	Use on slopes flatter than 4H:1V. Place geosynthetic liner, 24"NAG, 12" Ruby tailings, 12" soil, and revegetate.
Water Balance Cover	Use on slopes steeper than 4H:1V. Place 12" NAG, geotextile filter fabric, 36" soil, and revegetate.	Not used.	Not used.	Use on slopes steeper than 4H:1V. Place 36" NAG, geotextile filter fabric, 12" soil, and revegetate.	Use on slopes steeper than 4H:1V. Place 12" NAG, geotextile filter fabric, 24" Ruby tailings, 8" soil, and revegetate.	Use on slopes steeper than 4H:1V. Place 12" NAG, geotextile filter fabric, 12" Ruby tailings, 12" soil, and revegetate.
Soil Cover <i>24" NAG by lime amendment, 6" tailings, & 18" soil</i>	12" NAG and 12" soil over acid generating footprints or native ground. 12" soil over non-acid generating surfaces. Revegetate entire cover.	12"-24" NAG and 12" soil over acid generating materials or native ground. 12" soil over non-acid generating areas. Revegetate entire cover.	12"-24" NAG, 0"-7" Ruby tailings, and 12" soil over acid generating materials or native ground. 12" soil over non-acid generating areas. Revegetate entire cover.	Same as Alt. Z1.	12"-24" NAG, 10" Ruby tailings, and 8" soil over acid generating footprints or native ground. 8" soil or 10" Ruby tailings and 8" soil over non-acid generating areas. Revegetate cover.	6" Ruby tailings, and 18" soil over regraded surfaces. Test all areas for acid generating potential to depth of 24" and lime as required. Revegetate entire cover.

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Mine Pits:						
O.K./Ruby Pit <i>Cut notch in east highwall and backfill with Z82 and Z85/86 leach pads to be free draining.</i>	Backfill with Alder Gulch waste rock dump to make pit free draining; Cover backfill with water barrier and water balance reclamation covers.	Backfilled by interim reclamation. Cover backfill with 6" clay, PVC liner, 24" NAG, 12" soil, and revegetate.	Same as Alt. Z2. Cover backfill with 6" clay, PVC liner, 24" NAG, 7" Ruby tailings, 11" soil, and revegetate.	Same as Alt. Z2. Cover with water barrier and water balance reclamation covers.	Completely backfill pit to approximate original contour. Cover with water barrier and water balance reclamation covers.	Same as Alt. Z2. Cover backfill with 6" clay, PVC liner, 24" NAG, 12" Ruby tailings, 12" soil, and revegetate.
Mint Pit <i>Backfill to be free draining</i>	Backfilled by interim reclamation. Cover with water barrier reclamation cover.	Backfilled by interim reclamation. Cover backfill with 6" clay, PVC liner, 24" NAG, 12" Ruby tailings, 12" soil, and revegetate.	Backfilled by interim reclamation. Cover backfill with 6" clay, PVC liner, 24" NAG, 12" Ruby tailings, 12" soil, and revegetate.	Backfilled by interim reclamation. Cover with water barrier and water balance reclamation covers.	Completely backfill pit to approximate original contour. Cover with 24" NAG, 10" Ruby tailings, 8" soil, and revegetate.	Backfilled by interim reclamation. Lime amend top 24" of fill to NAG. Cover with 6" Ruby tailings, 18" soil, and revegetate.
North Alabama Pit	Minor grading to be free draining. Cover pit floor with water barrier reclamation cover.	Minor grading to be free draining. Cover with 12" soil only and revegetate.	Same as Alt. Z2.	Almost totally backfilled. Cover with water barrier and water balance reclamation covers.	Completely backfill pit to approximate original contour. Cover with 10" Ruby tailings, 8" soil and revegetate.	Fill to top of north pit wall with material from Alder Gulch waste rock dump. Cover backfill surface with water barrier reclamation cover.

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South Alabama Pit <i>Blast to reduce and cover west wall of pit; backfill along lower east benches; grade to be free draining.</i>	Grade to recontour steep rubble backfill slopes. Cover pit floor with water barrier reclamation cover.	Cover with 24" NAG, 12" soil, and revegetate.	Same as Alt. Z2. Cover with 24" NAG, 7" Ruby tailings, 11" soil, and revegetate.	Almost totally backfilled. Cover with water balance reclamation cover.	Completely backfill the pit to approximate original contour. Cover with 10" Ruby tailings, 8" soil, and revegetate.	Lime amend top 24 " of fill as NAG. Cover graded areas with 6" Ruby tailings, 18" soil, and revegetate.
Ross Pit <i>Grade for free drainage; cover sulfide benches and walls with NAG fill.</i>	Cover pit floor with 12" NAG, 12" soil, and revegetate.	Same as Alt. Z1.	Same as Alt. Z1.	Backfill and grade half-way up pit wall. Cover with water barrier and water balance reclamation covers.	Completely backfill the pit to approximate original contour. Cover with 10" Ruby tailings, 8" soil, and revegetate.	Same as Alt. Z1. Cover graded areas with 12"-24" NAG, 6" Ruby tailings, 18" soil, and revegetate.
Leach Pads:						
Z79-81 Pad	Re-reclaim with water barrier or water balance reclamation cover if needed to prevent cover soil acidification.	Existing 8-12" soil reclamation cover left as final reclamation. Enhance existing vegetation.	Same as Alt. Z2.	Remove existing reclamation. Replace with water barrier and water balance reclamation covers.	Same as Alt. Z2.	Same as Alt. Z2.

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Z82 Pad <i>Leach pad removed and backfilled in pits.</i>	Regrade slope on north side. Cover footprint with 12" NAG, 12" soil, and revegetate.	Regrade slope on north side. Lime amend top 24" of subgrade as NAG. Cover footprint and slope with 6" Ruby tailings, 18" soil, and revegetate.	Same as Alt. Z2.			
Z83 Pad <i>Regraded to 3H:1V and covered with 24" NAG, 6" tailings, and 18" soil.</i>	Remove interim reclamation and replace with water barrier and water balance reclamation covers.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.
Z84 Pad <i>Regraded to 3H:1V and covered with 24" NAG, 6" tailings, and 18" soil.</i>	Remove interim reclamation and replace with water barrier and water balance reclamation covers.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.

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Z85/86 Pad and Z85/86 Dike <i>Excavated portion for pit backfill; Regrade north area to 3H:1V slope; make free draining around the north edge.</i> <i>Put fill from drainage notch over Z85/86 Dike.</i>	Grade to 3H:1V slope with grading confined to lined area. Add fill to Z85/86 dike to make 2.5H:1V. Cover with water barrier and water balance reclamation covers.	Same as Z1. Cover with 24" NAG, 12" soil, and revegetate.	Same as Z1. Cover with 24" NAG, 7" tailings, 11" soil, and revegetate.	Same as Z1. Cover with water barrier and water balance reclamation covers.	Completely remove Z85/86 leach pad and dike for use as backfill. Cover footprint with 24" NAG, 10" tailings, 8" soil, and revegetate.	Excavate portion for pit backfill; Regrade remainder to 3H:1V make free draining around the north edge. Add fill to Z85/86 dike to achieve 2.5H:1V slope. Lime amend top 24" of subgrade as NAG. Cover regrade with 6" Ruby tailings, 18" soil, and revegetate.
Z89 Pad <i>Regraded to 3H:1V slope and covered with 24" NAG, 6" tailings, and 18" soil.</i>	Remove interim reclamation and replace with water barrier and water balance reclamation covers.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.	Interim reclamation cover left as final. Enhance existing vegetation on dike.

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Waste Rock Dumps:						
Ruby Sulfide Stockpile <i>Backfilled in bottom of O.K. pit.</i>	Cover footprint with 12" NAG, 12" soil, and revegetate.	Cover footprint with 24" NAG, 12" soil, and revegetate.	Cover footprint with 24" NAG, 7" tailings, 11" soil, and revegetate.	Cover with 12" soil and revegetate.	Cover footprint with 24" NAG, 10" tailings, 8" soil, and revegetate.	Lime amend top 24" of footprint as NAG. Cover footprint with 6" Ruby tailings, 18" soil, and revegetate.
Z82 Sulfide Stockpile <i>Placed in bottom of O.K. pit.</i>	Would be covered by pit reclamation.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.
South Ruby Waste Rock Dump <i>Top removed and placed in pit. Bottom regraded to 3:1 in place.</i>	Cover footprint with 12" NAG, 12" soil, and revegetate.	Lime amend top 24" of footprint as NAG. Cover with 6" Ruby tailings, 18" soil, and revegetate.	Same as Alt. Z2.	Cover footprint with water barrier and water balance reclamation covers.	Lime amend top 24 " of footprint as NAG. Cover with 10" tailings, 8" soil, and revegetate.	Same as Alt. Z2.
O.K. Waste Rock Dump	Salvage soil. Remove and use as pit backfill. Lime footprint, cover with 12" soil, and revegetate.	Leave existing reclamation as final.	Same as Alt. Z2.	Salvage soil, regrade to 3H:1V, and cover with water balance reclamation cover.	Salvage soil, regrade to 3H:1V, cover with 10" tailings, 8" soil, and revegetate.	Salvage soil, regrade to 3H:1V. Lime amend top 24" of footprint as NAG then cover with 6" Ruby tailings, 18" soil, and revegetate.

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Alder Gulch Waste Rock Dump	Salvage soil. Remove and use as pit backfill. Lime footprint and cover with 12" NAG, 12" soil, and revegetate.	Leave existing reclamation as final.	Same as Alt. Z2.	Same as Alt. Z1.	Salvage soil. Remove and use as pit backfill. Lime footprint and cover with 10" Ruby tailings, 8" soil, and revegetate.	Salvage soil. Remove 432,000 CY from top and use as pit backfill. Install water barrier cover over regraded excavation area.
Ruby Gulch Tailings:						
West Stockpile <i>Partially removed.</i>	Use as subsoil. Cover with 12" soil and revegetate.	Partial use as subsoil.	Same as Alt. Z1.	Same as Alt. Z1.	Use as subsoil. Cover with 8" soil and revegetate.	Same as Alt. Z1.
East Stockpile	Use as subsoil. Cover with 12" soil and revegetate.	Leave as is.	Same as Alt. Z1.	Same as Alt. Z1.	Use as subsoil. Cover with 8" soil and revegetate.	Same as Alt. Z1.
Tailings to Gate	Use as subsoil. Cover with 12" soil and revegetate.	Leave as is.	Same as Alt. Z2.	Same as Alt. Z1.	Use as subsoil. Cover with 8" soil and revegetate.	Partial removal for use as subsoil.
New Disturbance:						
Limestone Quarry LS-2	Develop 11-acre quarry to supply NAG material at LS-2 site.	No new disturbance. Limestone quarry would not be needed.	Same as Alt. Z2.	Develop 13-acre quarry to supply NAG material.	Same as Alt. Z2.	Same as Alt. Z2.
Goslin Flats	8-acre soil borrow area.	8-acre disturbance for water treatment plant.	None.	Same as Alt. Z2.	Same as Alt. Z2.	None.

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Drainage Notch around Z85/86 Leach Pad	3.6 acres	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.
Seepage Capture and Water Treatment:						
Water Treatment Plant and Ponds	Continue to use at current location.	Move to Goslin Flats.	Same as Alt. Z1.	Same as Alt. Z2.	Same as Alt. Z2.	Same as Alt. Z1.
Capture Systems	Upgrade as indicated by monitoring to meet MPDES discharge requirements.	Same as Alt. Z1. Pipe captured water to Goslin Flats for treatment.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.
Leach Pad Process Water	Upgrade treatment system to treat for nitrates and selenium. Pump treated pad water to Goslin Flats LAD.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.	Same as Alt. Z1.
Reclamation Schedule and Labor:						
Reclamation Timeframe	1999-2003	1999-2002	1999-2002	1999-2004	1999-2006	1999-2003
Direct Reclamation Employment	11-21 people	17-23 people	17-23 people	17-23 people	17-23 people	26 people